

**QUIZ 18: LESSON 30**  
**APRIL 10, 2017**

Write legibly, clearly indicate the question you are answering, and put a box or circle around your final answer. If you do not clearly indicate the question numbers, I will take off points. If you have any questions, raise your hand and I will come over to you.

1. Consider the system of equations

$$\begin{cases} 3x + 2y = -1 \\ -x + 2y = -5 \end{cases}$$

- (a) [1 pt] Write down the augmented matrix that corresponds to this system of equations.

**Solution:** This is just

$$\left[ \begin{array}{cc|c} 3 & 2 & -1 \\ -1 & 2 & -5 \end{array} \right].$$

- (b) [3 pts] Put the matrix from part (a) into row-echelon form. Clearly label each row operation you use.

$$\left[ \begin{array}{cc|c} 3 & 2 & -1 \\ -1 & 2 & -5 \end{array} \right] \xrightarrow{R_1 \leftrightarrow R_2} \left[ \begin{array}{cc|c} -1 & 2 & -5 \\ 3 & 2 & -1 \end{array} \right]$$

$$\xrightarrow{-R_1 \rightarrow R_1} \left[ \begin{array}{cc|c} 1 & -2 & 5 \\ 3 & 2 & -1 \end{array} \right]$$

$$\xrightarrow{-3R_1 + R_2 \rightarrow R_2} \left[ \begin{array}{cc|c} 1 & -2 & 5 \\ 0 & 8 & -16 \end{array} \right]$$

$$\xrightarrow{\frac{1}{8}R_2 \rightarrow R_2} \left[ \begin{array}{cc|c} 1 & -2 & 5 \\ 0 & 1 & -2 \end{array} \right]$$

- (c) [2 pt] What is the solution to the system of equations?

**Solution:** By our work in part (b), we know that

$$\begin{cases} x - 2y = 5 \\ y = -2 \end{cases}$$

So by substituting  $y = -2$  into the first equation, we get

$$x - 2y = 5 \Rightarrow x - 2(-2) = 5 \Rightarrow x + 4 = 5 \Rightarrow x = 1.$$

Thus, the solution is

$$(x, y) = (1, -2).$$

2. [4 pts] Put the matrix

$$\left[ \begin{array}{ccc|c} 1 & -2 & 5 & -1 \\ -1 & 3 & 2 & 10 \\ 2 & -4 & 11 & 0 \end{array} \right]$$

into row-echelon form. Clearly label each row operation you use.

**Solution:** This might look intimidating but it can be done in two row operations.

$$\left[ \begin{array}{ccc|c} 1 & -2 & 5 & -1 \\ -1 & 3 & 2 & 10 \\ 2 & -4 & 11 & 0 \end{array} \right] \xrightarrow{R_1+R_2 \rightarrow R_2} \left[ \begin{array}{ccc|c} 1 & -2 & 5 & -1 \\ 0 & 1 & 7 & 9 \\ 2 & -4 & 11 & 0 \end{array} \right] \xrightarrow{-2R_1+R_3 \rightarrow R_3} \left[ \begin{array}{ccc|c} 1 & -2 & 5 & -1 \\ 0 & 1 & 7 & 9 \\ 0 & 0 & 1 & 2 \end{array} \right].$$